NEW INSIGHTS INTO THE STEINHEIM CENTRAL UPLIFT – PART I: SHATTER CONES IN CLAYSTONE LITHOLOGIES (‘OPALINUSTON’, MIDDLE JURASSIC)

E. Buchner[1,2] and M. Schmieder[1]. [1]Institut für Planetologie, Universität Stuttgart, Herdweg 51, D-70174 Stuttgart, Germany, elmar.buchner@geologie.uni-stuttgart.de. [2]HNU Neu-Ulm University, Wileystrasse 1, D-89231 Neu-Ulm, Germany.

Introduction: The ~3.8 km Steinheim Basin in SW Germany is a complex impact crater with central uplift hosted by a sequence of Triassic to Jurassic sedimentary rocks. The sedimentary rocks of the crater floor, as well as the intensely brecciated blocks that form the crater rim, consist of Upper Jurassic limestones. Findings of shatter cones were so far restricted to micritic Upper Jurassic limestones at the rim of the Steinheim Basin. Middle Jurassic sandstones and claystones crop out on top of the Steinheim central uplift. The construction of a water catchment on the central peak actually provides new insights into this Middle Jurassic sedimentary suite affected by the impact.

New Observations: Shatter cones in micritic Upper Jurassic limestones are well-known from the Steinheim impact structure. In addition, we here newly report shatter cones in fine-grained sandstones (Middle Jurassic ‘Eisensandstein’), as well as in up to dm-sized concretionary claystone nodules of the underlying Middle Jurassic ‘Opalinuston’ claystone that build up the central uplift. Shatter cones are well-defined (up to ~5 cm in length; Fig. 1) and show variable orientations [1].

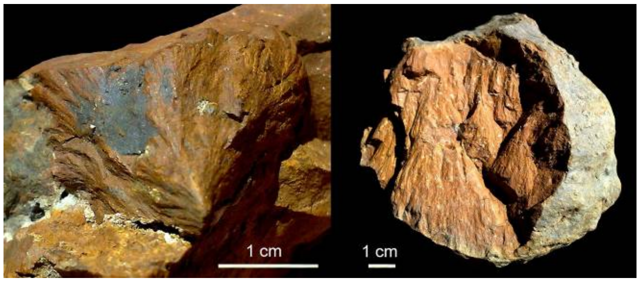

Fig. 1: Newly discovered shatter cones in claystone nodules from the Middle Jurassic ‘Opalinuston’ claystone.

Discussion: Although the local shatter cone orientation pattern in limestones and sandstones of the Steinheim Basin is not strictly defined, shatter cone orientations within the ‘Opalinuston’ at Steinheim are extremely variable [1]. To our knowledge, this is the first report of shatter cones in claystone lithologies, which indicates that the soft and incompetent ‘Opalinuston’ was capable of transferring intense shock waves (pressures ≥ 2 GPa [2]). However, it must be kept in mind that the contact between the ‘Opalinuston’ claystones and the Steinheim projectile was very close, accompanied by an enormous initial shock pressure and subsequent stratigraphic uplift of ~350 m of the Middle Jurassic. Only very few shocked quartz grains have so far been reported from Steinheim, which points towards a shock buffering effect within the target. We suggest that the combination of high amounts of subsurface water [3] and soft clays at the center of the Steinheim Basin were not conductive to the highest levels of shock (> 10 GPa) in the target rocks.

References: [1] Schmieder M. and Buchner E. 2010. This volume. [2] Baratoux D. and Melosh H. J. 2003. *Earth and Planetary Science Letters* 216:43-54. [3] Schmieder M. and Buchner E. 2010. Nördlingen 2010 Meeting, Abstract #7001.